

Monetary Incentives and Early Initiation of Antenatal Care: A Matched-Pair, Parallel-Cluster Randomized Trial in Zambia.



Authors Chitalu Miriam Chama-Chiliba | Peter Hangoma | Natalia Cantet
| Patricia Funjika | Grayson Koyi | Maria Laura Alzúa

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Abstract

Monetary incentives are often used to increase the motivation and output of health service providers. However, the focus has generally been on frontline health service providers. Using a cluster randomized trial, we evaluate the effect of monetary incentives provided to community-based volunteers on early initiation of antenatal care visits and deliveries in health facilities in communities in Zambia. Monetary incentives were assigned to community-based volunteers in treatment sites, and payments were made for every woman referred or accompanied in the first trimester of pregnancy during January-June 2020. We found a significant increase of about thirty-two percentage points in the number of women seeking antenatal care visits in the first trimester but no effect on coverage rates (the percentage of women who deliver at a health facility and are assisted by skilled birth attendants). The number of women accompanied by community-based volunteers for antenatal care in the first trimester increased by thirty-three percentage points. Deliveries in health facilities also increased by twenty-two percentage points. These findings suggest that the use of health facilities during the first trimester of pregnancy can be improved by providing community-based volunteers with monetary incentives and that such incentives can also increase deliveries in health facilities, which are key to improving the survival of women and newborns.

Keywords: Results-Based Financing, Community, Antenatal Care, Developing country, Cluster Randomized Trial.

JEL Classification: I11, I15, I18

Authors

Chitalu Miriam Chama-Chiliba

University of Zambia,
Lusaka, Zambia

chitalu.chiliba@unza.zm

Peter Hangoma

University of Zambia, Lusaka, Zambia
Chr. Michelsen Institute (CMI) and University of
Bergen, Bergen, Norway

peter.hangoma@unza.zm

Natalia Cantet

Universidad EAFIT, Colombia

mncantet@eafit.edu.co

Patricia Funjika

University of Zambia, Lusaka, Zambia

patricia.funjika@unza.zm

Grayson Koyi

University of Zambia, Lusaka, Zambia

grayson.koyi@unza.zm

Maria Laura Alzúa

CEDLAS, Universidad Nacional de La Plata,
CONICET, and Partnership for Economic Policy,
Argentina

malzua@depeco.econo.unlp.edu.ar

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Table of Contents

I.	Introduction	1
II.	Background	5
	2.1 Maternal Health in Zambia	5
	2.2 The Community Health System in Zambia	5
	2.3 Community Health Workers	7
III.	Intervention and Experimental Design	8
	3.1 Intervention	8
	3.2. Experimental Design	9
IV.	Data	10
	4.1 Sample and Data Collection	10
	4.2 Outcomes of Interest	11
	4.3 Baseline Balance	12
	4.4 Attrition	14
V.	Empirical Strategy	14
VI.	Results	15
VII.	Mechanisms: NHC level results	18
VIII.	Conclusion and Policy Implications	21
	References	22
	Appendices	26
	Appendix A: Orientation Guidelines and Field Plan	26
	Appendix B: Poster and Text Message	31
	Appendix C: Generating the Distance Buffer	32
	Appendix D: Power Determination	33
	Appendix E: Adapted Community-Level Score Card	34
	Appendix F: Qualitative Tools	35
	Appendix G: Attrition Tables at the Facility and NHC Level	41
	Appendix H: Additional Facility and NHC Level Analysis	43

List of Tables

Table 1: Comparison of Baseline Characteristics between Treatment and Control Health Facilities	13
Table 2: Facility Level Regression results	17
Table 3: OLS Regression—NHC-Level Regression Results on Early Initiation of Antenatal Care	19
Table G1—Attrition.....	41
Table G2—Attrition Analysis at Facility and NHC Level	42
Table H1: Facility-Level OLS sensitivity analysis	43
Table H2: OLS Sensitivity Regression—NHC-level regression results on early initiation of antenatal care.....	44

List of Figures

Figure 1: Organizational Structure for the Community Health System	6
Figure 2: Geographical Distribution of Health Facilities, Central Province, Zambia	11
Figure 3: Mean Antenatal-care visits (antenatal care) in Treatment and Control Sites.....	20

I. Introduction

Quality health interventions for pregnant women and newborns are key to improving children's health. Poor childhood health has been linked to lower cognitive skills, increased health problems, lower education outcomes, and decreased income (Behrman & Rosenzweig, 2004; Black, Devereux & Salvanes, 2007; Boardman et al., 2002; Currie & Moretti, 2007; Royer, 2009).¹ Interventions aimed at improving early childhood health have been highlighted as cost-effective ways for governments and communities to increase overall well-being (Campbell et al., 2014; Conti, Heckman & Pinto, 2016). However, there is a critical shortage of health workers capable of delivering interventions. To this end, most governments in low- and middle-income countries have turned to the services of community-based volunteers (hereafter, CBVs), who have been heralded as critical to improving access to healthcare and to reducing health inequities (Scott et al., 2018; WHO, 2018).

We studied the effects of an intervention conducted in collaboration with the Zambian government that provided monetary incentives to CBVs for either referring or escorting women to antenatal care within the first trimester (fourteen weeks) of their pregnancies. We adopted a matched-pair, cluster-randomized parallel design to evaluate the effect of the program on antenatal-care visits and deliveries in healthcare facilities. Ninety-eight rural health centers and health posts in the Central Province were paired based on administrative data. Random assignment to treatment or control groups was performed for each pair, resulting in a parallel design with a 1:1 allocation ratio.

While the decision to seek antenatal care relies more on patient behaviour and

¹ From a medical perspective, initiating antenatal-care visits in the first trimester is crucial for the identification and treatment of medical complications and for providing advice on proper nutrition to reduce the risks for the unborn baby (Carroli, Rooney & Villar, 2001; Hawkes, Gomez & Broutet, 2013). Evidence in the economics literature shows that early initiation of antenatal-care visits is crucial for positive outcomes during pregnancy and birth and for newborns. For instance, Gertler, Giovagnoli, and Martinez (2014) found that the use of antenatal-care services reduced the probability of low birth weight and neonatal mortality. Earlier studies also showed that delays in initiating care had a negative effect on birth weight (Rosenzweig & Schultz, 1983; Joyce & Grossman, 1990). Another strand of literature shows relationships among nutrition, birth defects, and the timing of health interventions (such as supplements or food fortification) during pregnancy (Romano et al., 1995; Bendich, Mallick & Leader, 1997).

may thus require incentives to be directly targeted at the patient, providing incentives to CBVs to identify patients and encourage them to visit clinics is a feasible alternative (Gertler et al., 2010; Akinyi, Nzanzu & Kaseje, 2015; Viswanathan et al., 2012). Celhay et al. (2019) found that health facilities could improve the early initiation of antenatal-care visits through outreach approaches in which CBVs identified and targeted newly pregnant women and encouraged them to seek antenatal care.

CBVs act as a link between the community and frontline workers by providing information that enables facility managers to better understand, respond to, and serve community needs through healthcare promotion, case management, and service delivery at the community level (Bhattacharyya et al., 2001; WHO, 2018; Scott et al., 2018). In the Zambian context, CBVs deliver services in their communities under various health- and other social-sector programs on an unpaid, part-time basis (Ministry of Health, 2017). Ministries of health or other organizations may face resource constraints that do not permit them to pay community-based health-service workers over the long term (Bhattacharyya et al., 2001). The policy challenge has been whether monetary incentives currently directed toward frontline health workers should be extended to CBVs. Evidence shows that volunteers are unlikely to continue to serve without receiving some form of payment, particularly when tasks and workload increase (Miyake et al., 2015).

Providing incentives, both financial and non-financial, to community members has been shown to be an effective tool in motivating health workers to improve health outcomes. Kok et al. (2015) suggested that a mix of financial and non-financial incentives was an effective strategy for increasing the performance of CBVs, particularly for those who had multiple responsibilities, but they noted that unmet promises led to demotivation.² In a field experiment in Zambia, on the other hand, Ashraf, Bandiera, and

² Some studies have used quasi-experimental designs based on difference-in-differences approaches and using administrative data (Alzúa & Katzkowitz, 2021; Gertler et al., 2014) while others have used experimental approaches (De Walque et al., 2015; Olken, Onishi & Wong, 2014; Celhay et al., 2019; Ashraf, Bandiera & Jack, 2014) to detect the effects of incentives on the use of antenatal services and on newborn outcomes. The studies have detected effect sizes on antenatal outcomes varying from ten percentage points increase in receipt of

Jack (2014) found that non-financial incentives were more effective at improving the performance of agents in public service delivery and that these types of incentives were more effective in contexts in which financial incentives had limited power.

Clear evidence shows that providing incentives to healthcare providers can increase the use of maternal and child health services, improve outcomes (Basinga et al., 2010; Gertler, Giovagnoli & Martinez, 2014; Alzúa & Katzkowitz, 2021; Gertler & Vermeersch, 2013), and improve the quality-of-service delivery (Basinga et al., 2010; Gertler, Giovagnoli & Martinez, 2014). Most studies, however, have focused on incentivizing healthcare providers (Alzúa & Katzkowitz, 2021; Basinga et al., 2010; Gertler, Giovagnoli & Martinez, 2014; De Walque et al., 2015; Celhay et al., 2019; Gertler & Vermeersch, 2013), with fewer studies looking at incentivizing CBVs to increase antenatal-care visits. The few studies with a focus on CBVs have suggested that providing monetary incentives to volunteers for referring and escorting pregnant women to health facilities promotes good maternal health practices. Oyebola et al. (2014), for instance, found that providing performance-based incentives to traditional birth attendants for referring and escorting pregnant women to health facilities was a useful strategy to promote healthcare-seeking behaviour among women in rural and hard-to-reach settings. Using a randomized study, Chukwuma et al. (2019) also showed that monetary rewards for maternal referrals increased the proportion of maternal clients that attend postnatal care within forty-eight hours of delivery by 15.4 percentage points, and the proportion of neonatal clients that attended postnatal care within forty-eight hours of delivery by 12.6 percentage points. Both studies were conducted in Nigeria. Basinga et al. (2010), however, found no significant effect of incentivizing health workers on the number of antenatal care visits. The results were explained as being partly due to the relatively small monetary incentives, which provided little incentive to find the few women who do not use antenatal services at all. In Rwanda, performance incentives paid to health workers did not increase the early initiation of antenatal care visits. The

adequate antenatal check-ups (Alzúa & Katzkowitz, 2021) to a 34% increase in the rate of early initiation of antenatal-care visits while incentives were being paid, and these effects persisted for about twenty-four months after the incentives ended (Celhay et al., 2019).

explanation was that these services needed a higher effort given that the decision to seek antenatal care depends on the mothers, and the health providers had low monetary incentives (Gertler & Vermeersch, 2013).

We found that monetary incentives led to an increase in the number of antenatal-care visits but not in the antenatal-care coverage rate—defined as the percentage of women aged 15-49 who received antenatal care within the first three months (14 weeks) of their pregnancy (measured using administrative data). Additionally, we found that monetary incentives motivated CBVs to accompany women for antenatal services, leading to an increase in the number of women who received care in the first trimester. However, the incentives did not increase referrals, and this effect dominated, resulting in an insignificant overall effect based on data from the Neighbourhood Health Committee (hereafter, NHC) level. Deliveries in healthcare facilities increased, but the coverage rate—which refers to the percentage of women who delivered at a health facility and were assisted by skilled birth attendants— did not. We also found no differential effects of the community incentives by gender.

Our study contributes to the health-economics literature in two specific ways. First, it adds experimental evidence to the scarce literature that examines the effects of monetary incentives targeted at CBVs on the improvement of early antenatal care in low- and middle-income countries. We also provide a novel methodological approach for local-level intervention with pairwise matching in the presence of a small number of clusters.

The program that we evaluated has important public policy implications. Through the Zambian government’s Vision 2030 plan, the country has prioritized health and is committed to the attainment of “equity of access to cost-effective quality health services, as close to the family as possible” (Ministry of Health, 2017). The policy targets the strengthening of established community-based agents in supporting expectant mothers to seek medical attention. Thus, our findings provide evidence for improving the health system at the local level.

II. Background

2.1 Maternal Health in Zambia

Zambia is a low- to middle-income country with an estimated 2019 per capita GDP of \$1,291.34 USD (World Bank, 2020). The country faces stark inequality in access to healthcare between rural and urban areas. Poor maternal and child health outcomes have been attributed partly to low use of and access to health services. Rural areas face a disproportionately higher share of maternal and neonatal mortality. For instance, 73% of births in rural areas are delivered by a skilled provider compared to 93% in urban areas (Zambia Statistics Agency, Ministry of Health & ICF International, 2019).

Zambia has ten provinces, and this study was conducted in Central Province. The province is predominantly rural, includes eleven districts, and has 293 health facilities, of which about 91% are public (Zambia Statistics Agency, Ministry of Health Zambia, and ICF International, 2018). Timely antenatal-care attendance has historically been low in Zambia, with only about a third of women in 2018 receiving antenatal care during their first trimester (Zambia Statistics Agency, Ministry of Health Zambia & ICF International, 2018). Notably, the proportion of women seeking antenatal care in the first trimester in Central Province is among the lowest in the country at 19.2% in 2018 (Ministry of Health, 2018). Initiation of antenatal-care attendance in the first trimester provides an opportunity to detect complications early enough to treat them without risk to mother or baby (Zolotor & Carlough, 2014).

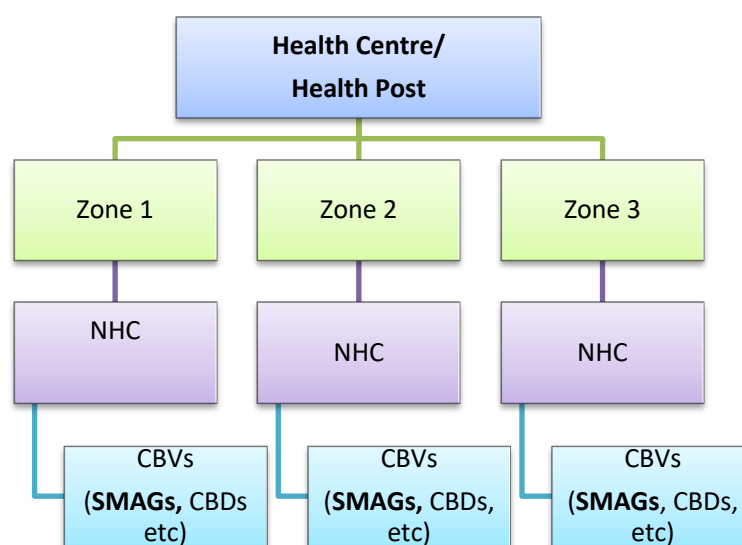
2.2 The Community Health System in Zambia

In Zambia, community-health systems operate at the lowest level of primary health-service delivery and cover health centers and health posts. These lower-level health facilities partner with community-based health workers through community-based structures. The NHC is the link between the community and health centers and comprises community members in a given health-facility catchment area. The NHC includes traditional and community leaders; women, men, and youths; representatives from the poorest families and from different cultural groups; retired civil servants; and

representatives from NGOs.

Figure 1 shows the organizational structure of the community health system. In practice, the number of NHCs per facility catchment area varies from two to eighteen. The NHCs supervise the activities of CBVs in their zones. Because CBVs reside in the communities and are often well-known by community members, their role in maternal health includes identifying pregnant women within their catchment areas. Pregnant women are visited by CBVs at home and encouraged to seek antenatal care early within the first trimester. The CBVs may also accompany pregnant women to seek antenatal care at a health facility. For instance, pregnant, unmarried women may be accompanied by the CBVs to provide support for their first registration. As a result of the government policy initiative to encourage men to be involved, women are often required to be accompanied by their partners, and unmarried women may require support from the CBVs.

Figure 1: Organizational Structure for the Community Health System



Source: Ministry of Health, 2018

Note: CBD is defined as Community-Based Distributors

CBVs are supported by the Zambian government and cooperating partners and they work in such categories as reproductive health, nutrition, community case management, water and sanitation, and HIV/TB and malaria. Groups of CBVs differ based on recruitment and training done through community systems and cooperating partners. The Community Health Strategy 2017-2021 plan proposed monetary and non-monetary incentives for

community volunteers,³ which are not yet harmonized, as follows: refreshments, lunch, transportation refund, training and orientation, identification cards, protective clothing, encouraging exchange visits, involving the NHCs for national events, free health consultation at health centers, and involvement of NHCs in the training of trainers and of other CBVs in health promotion and community health (Ministry of Health, 2017). The involvement of community volunteers in activities such as training helps to keep them motivated and feel recognized.

2.3 Community Health Workers

Increased attrition among CBVs that is attributed to a lack of financial incentives leads to the need to continuously recruit and train new volunteers (Bhattacharyya et al., 2001; Akintola, 2011). Evidence shows that financial incentives can reduce CBV attrition (Miyake et al., 2015). Challenges of providing monetary incentives, however, can include: 1) lack of sufficient funding and the tendency of volunteers to demand more benefits, money, and opportunities for promotion; 2) irregular payments that may stop when funding runs out; 3) inconsistencies in payment among CBVs recruited under different programs but working in the same communities can create animosity; 4) and the possibility that monetary incentives can destroy the spirit of voluntarism, which may change the community's perception of CBVs and reduce willingness to support them (Bhattacharyya et al., 2001).

The Government of Zambia, through partner support, has made strides in incentivizing CBVs by providing materials and, at times, financial incentives to support their work. This support, driven by funding partners, has tended to be short-term, and providing incentives to CBVs has not been part of official policy.⁴

³ Community volunteers include NHCs and CBVs

⁴ The current resource envelope is far below the minimum required for the delivery of an optimum package of care despite significant increases in the flow of funds to the health sector. However, international partners, including the World Bank, have piloted efforts to provide monetary incentives to improve the performance of community-based agents in Zambia. The results have been encouraging and suggest the need to extend monetary incentives.

The proposed new policy in Zambia to scale up and standardize monetary incentives to CBVs is anchored in the appropriate sequencing and a more coordinated implementation of NHC guidelines complemented by strengthening existing community-level structures for heightening awareness, mentorship, and attitudinal change. Given that CBV programs are context-specific, the need for evidence based on local realities to guide the development of programs and make decisions is crucial (Scott et al., 2018).

III. Intervention and Experimental Design

3.1 Intervention

In this study, monetary incentives were based on the number of women referred (advised) or accompanied (escorted) to seek antenatal care in their first trimester of pregnancy (i.e., within fourteen weeks) at a healthcare facility. To separate the effect of a monetary incentive from the effect of reminding NHC of the importance of early antenatal-care attendance, we held orientation meetings in both the treatment and control facilities at which detailed information on the intervention was provided (see orientation plan in Appendix A).

After the orientation meeting, we also sent text notifications to both intervention and control sites to remind the NHCs of the importance to pregnant women of seeking early antenatal care (fourteen weeks or earlier). To mitigate the effect of limited access to text messages, a poster was placed in all health facilities (see Appendix B).

The size of the monetary incentive provided to NHCs was similar in magnitude to the amounts that other results-based financing projects (hereafter, RBFs) in Zambia have used to incentivize community volunteers. The basic minimum wage for the general worker category in Zambia is ZMW 1,050.00 per month or about ZMW 35.00 per day. We paid NHCs ZMW 5.00 per woman referred or accompanied. The average number of antenatal-care visits per quarter per facility was 100 (based on data from the Health Management Information System;

hereafter, HMIS), and the incentive per facility was ZMW 400.00. This amount was paid after health facility managers validated the figures reported by the NHCs. The payment was made at the end of each quarter based on the number of women referred for antenatal care in the first trimester. Facility managers were responsible for paying monetary incentives to the NHCs in cash.

3.2. Experimental Design

We adopted a matched-pair cluster-randomized parallel design to evaluate the effect of monetary incentives on early initiation of antenatal-care visits by pregnant women and on deliveries in healthcare facilities. If the interest is to maximize efficiency and power, this study design is ideal when the number of clusters is small (Balzer et al., 2015; Imai, King & Nall, 2009). Ninety-eight rural health facilities were paired based on administrative data on distance to the District Medical Office, the number of maternity beds, and population catchment area, resulting in forty-nine pairs.

Randomization to treatment and control was done within each pair, resulting in a parallel design with a 1:1 allocation ratio. All health facilities classified as rural and operated by skilled staff in Central Province were eligible for inclusion. The rationale for focusing on rural health facilities was the relatively lower rates of antenatal-care attendance in the first trimester in rural areas. All health facilities in the control and treatment arms had NHCs with CBVs trained in birth-preparedness and in the importance of timely antenatal care (Safe Motherhood Action Groups or, hereafter, SMAGs). All NHCs in the sampled facilities were eligible to participate in the study. To be considered for the intervention, an NHC had to be active and had to have CBVs trained in birth preparedness in SMAGs.

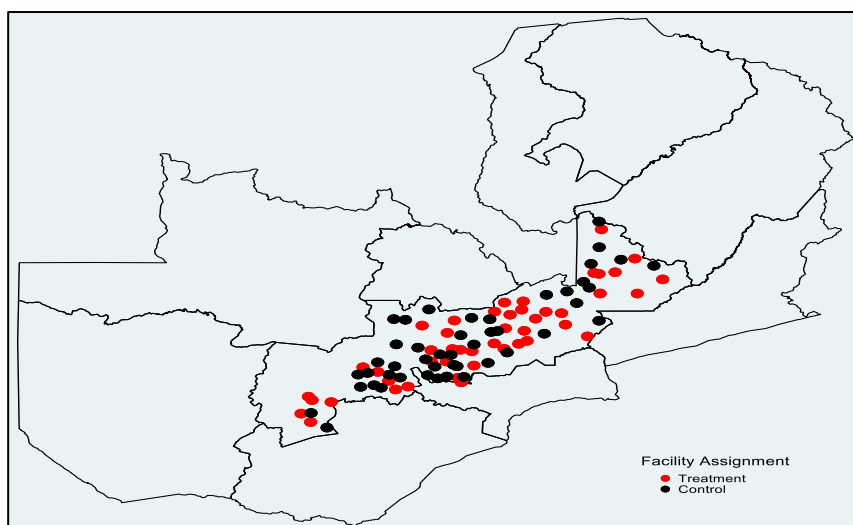
IV. Data

4.1 Sample and Data Collection

All rural health centers in Central Province were eligible to be included in the study. In the initial stage, eighty-nine rural health centers and twenty-nine health posts in Central Province were selected based on the availability of administrative and global positioning system (GPS) data. Administrative data included the number of maternity beds, distance to a District Medical Office, population catchment area, and the proportion of antenatal care visits in the first trimester for the year 2018. Only rural health posts with a catchment area of 5,000 or more were included in the sample. Rural health centers and health posts were pooled and paired via a pairwise Mahalanobis matching method using an optimal greedy algorithm adapted from Bruhn and McKenzie (2009). The final sample consisted of ninety-eight rural health facilities (twenty-one rural health posts and seventy-seven rural health centers). For each matched pair, one was randomly assigned to treatment and the other to the control group with a distance buffer of about eight kilometres (Appendix C). Detailed power calculations are presented in Appendix D.

For the primary outcome, we collected monthly HMIS data between the first quarter of 2018 and the second quarter of 2020 for antenatal-care visits. We collected administrative HMIS data for the secondary outcome (proportion and number of pregnant women giving birth at a health facility) at the facility level. At the NHC level, we collected data on secondary outcomes in the control and treatment sites using an adapted NHC activity-reporting form during the January-June 2020 intervention period (see Appendix E). We also collected qualitative data from health facility managers/health workers during the midline and endline data collection phases in selected facilities to provide additional context for some of the findings (see Appendix F).

Figure 2: Geographical Distribution of Health Facilities, Central Province, Zambia



Source: Authors' construction using health facility GPS data.

4.2 Outcomes of Interest

We analyzed two sets of outcomes: the number and coverage of antenatal-care visits in the first trimester and the number and coverage of deliveries in healthcare facilities.

The primary outcomes of interest with regard to antenatal care were the number and coverage of antenatal-care visits in the first trimester. Antenatal-care coverage in the first trimester is defined as the percentage of women aged 15-49 who received antenatal-care visits within the first three months (fourteen weeks) of their pregnancy. The coverage rate was calculated by dividing the number of pregnant women seeking antenatal care before fourteen weeks by expected annual pregnancies.

The variables of interest regarding deliveries were those that occurred in a health facility and were assisted by qualified midwives. We considered both the total number of women who chose to give birth in a facility and the coverage, which was estimated using the same methodology as we used for the antenatal-care variables. Data were derived by dividing the total number of deliveries in a health facility by the expected annual deliveries.

The coverage outcomes had certain limitations. For various reasons, people residing within the area of influence of a particular facility may choose to go to a facility outside of their area. As a result, a facility's coverage could be greater than 100 because of visits by

people from other areas of influence. This is less likely at the district level because the facility coverage rate is aggregated at the district level.

To further understand the mechanisms through which the incentives worked, we estimated the effects of the treatment on antenatal-care visits in the first trimester at the NHC level. We defined 1) the total number of women referred by a CBVs for antenatal care during the first trimester; 2) the number of women accompanied by a CBV for antenatal care during the first trimester; and 3) the total number of women who sought antenatal care during the first trimester, which is the sum of the previous two variables.

4.3 Baseline Balance

Table 1 compares baseline characteristics between treatment and control facilities. To compare facilities in both groups, we considered the outcomes of interest for the two years prior to the implementation of the program (2018 in Panel A and 2019 in Panel B) along with geographic characteristics that we used for the pairwise matching randomized design (shown in Panel C). We present the treatment and control means and the difference in Columns 1, 2, and 3, respectively.

Overall, Table 1 suggests that the baseline characteristics of facilities in the control and treatment are similar: none of the observed differences in the means was statistically significant. The differences in coverage and number of antenatal care visits in 2018 (five visits and three percentage points) and 2019 (five visits and four percentage points) were not statistically significant. Control facilities had slightly higher delivery-coverage rates in both years. None of the differences in means was statistically significant, however.

The pairwise matching variables presented in Panel C are also statistically similar. The difference in average distance from the District Health Office between treatment and control facilities is 1.53 km. Additionally, control facilities have 0.265 fewer maternity beds per facility and 161 fewer individuals per catchment area. Again, there are no statistically significant differences between the groups of interest.

Table 1: Comparison of Baseline Characteristics between Treatment and Control Health Facilities

	Control Mean (1)	Treatment Mean (2)	Difference (3)
Annual data for 98 health facilities (49 treatment and 49 control)			
Year 2018			
1 st antenatal number in the 1 st trimester	77.898 (10.619)	83.204 (9.841)	5.306
1 st antenatal-care visit % in the 1 st trimester (1)	22.347 (2.002)	19.378 (1.533)	-2.969
Number of deliveries in healthcare facilities	16.759 (1.675)	17.345 (1.724)	-0.586
Institutional delivery coverage % (2)	62.095 (6.013)	54.015 (3.756)	8.080
Observations	49	49	
Annual data for 98 health facilities (49 treatment and 49 control)			
Year 2019			
1 st antenatal number in the 1 st trimester	77.898 (10.619)	83.204 (9.841)	-5.306
1 st antenatal number in the 1 st trimester	23.028 (2.183)	19.167 (2.156)	3.861
Number of deliveries in healthcare facilities	16.352 (1.644)	16.231 (1.391)	0.121
Institutional delivery coverage %	58.950 (5.929)	51.195 (3.745)	7.755
Observations	49	49	
Monthly data for 98 health facilities (49 treatment and 49 control)			
Pairwise Matching variables			
Average distance of facility from the District Health Office (in kilometres)	76.347 (10.332)	77.884 (10.332)	-1.537
Average number of maternity beds per facility	2.551 (0.389)	2.816 (0.389)	-0.265
Average population in facility catchment area	7,604.469 (781,694)	7,766.367 (781,694)	-161.898
Observations	49	49	

Notes: Standard errors in parentheses. Antenatal care = Antenatal-care visits; 1st antenatal-care visit % in the 1st trimester = percentage of antenatal-care visits in the first trimester, coverage of deliveries in healthcare facilities; % = percentage of deliveries in healthcare facilities. *** p<0.01, ** p<0.05, * p<0.1

4.4 Attrition

In Appendix Table G1, we provide a detailed account of attrition for the treatment and control groups at the facility and NHC level by month. Overall, at the facility level, attrition was small (3%) for antenatal-care visits, antenatal-care coverage, and institutional-delivery coverage in the first trimester. It increased to 117 month-facility level observations (20%) for the number of institutional deliveries. Next, the referred and accompanied antenatal care in the first trimester attrition amounted to approximately 26% of the sample.

Given the high level of attrition for the number of institutional deliveries and the NHC-level analysis, we examined the relationship between the missing observations and the treatment, accounting for month fixed effects and several important geographic control variables, and the results appear in Table G2. As shown, we found that there is no statistically significant relationship between attrition and being a treated facility or being assigned to a treatment NHC across facility and NHC levels.

V. Empirical Strategy

We begin the analysis with the regression of the form:

$$y_{it} = \gamma_0 + \gamma_1 \text{Treatment}_{it} + \gamma_2 \sum_{r=1}^{R-1} \text{pair}_r + \mu_{it} \quad (1)$$

where y_{it} is the outcome of interest for facility i at time t . Treatment_{it} is an indicator variable equal to one if NHCs in the catchment area of facility i were randomized to monetary incentives and zero otherwise. Under baseline balance, γ_1 captures the impact of monetary incentives. To account for pairwise matching, we also include the variable pair_r where R is the number of matched facility pairs and μ_{it} is the error term. For the primary outcome of interest, y_{it} is defined as the outcomes of interest facility i who had

an early antenatal visit in month t . Standard errors are clustered at the facility level.⁵

To account for possible differences in the application of the program across districts, we also included district-level fixed effects and time effects in the model. Lastly, we added a vector of facility-level controls X .⁶

VI. Results

Table 2 shows the results of the facility-level regressions for antenatal-care visits in the first trimester (Panel A) and deliveries in healthcare facilities (Panel B) as dependent variables for the January-June 2020 period for ninety-eight health facilities. All regressions include randomization pair fixed effects. In Columns 2 and 5, we have added district and month fixed effects and, finally, in Columns 3 and 6, we have included facility-level controls.

Panel A presents the regression results for the number of antenatal care visits (Columns 1-3) and antenatal-care coverage rate (Columns 4-6). The coefficient for the number of women seeking antenatal care was 5.756 but is not statistically significant. With the addition of fixed effects and controls, however, coefficients for the treatment effects became 26.219 and 24.511, respectively, and are statistically significant at the 5% level. The coefficients thus, represents an increase of approximately thirty-two percentage points with respect to the monthly average for control facilities. The coefficients for antenatal-coverage rates are positive once fixed effects and controls are added, although they are not statistically significant.

Columns I-VI in Panel B show regression coefficient results for total deliveries in

⁵ Because we were using panel data, standard errors were likely understated because $Cov\left(\frac{\mu_{it}, \mu_{is}}{Inc_{it}}\right) \neq 0$ for $t \neq s$.

⁶ To assess differences in effects due to the gender composition of CBVs, we included the ratio of women in NHCs and SMAGs in the regression model along with the corresponding interaction terms. The ratios were defined as the proportion of women in an NHC (SMAG) compared to the total NHC (SMAG) size.

healthcare facilities and the facility-delivery coverage rate. Notably, the results show that the number of deliveries in healthcare facilities increased by seventeen percentage points as a result of the intervention, and this effect increased twenty-two percentage points after district and time effects and controls were included (Columns 2 and 3). However, there was no significant effect on the coverage rate of deliveries in healthcare facilities (Columns 4 through 6).

Table 2. Facility Level Regression results

Panel A: antenatal-care visits in the first trimester					
	Total antenatal-care visits in the 1st trimester			antenatal care coverage in the 1st trimester	
	(1)	(2)	(3)	(4)	(5)
Treatment	5.756 (11,357)	26.219** (10,236)	24.511** (9,729)	-3.989 (2,566)	1.156 (1,892)
Observations	570	570	570	570	570
R ²	0.447	0.604	0.664	0.220	0.403
Mean (Control Group)	79.851 (5,006)	79.851 (5,006)	79.851 (5,006)	29.523 (1,540)	29.523 (1,540)
Panel B: Institutional deliveries					
	Total institutional deliveries in the 1st trimester			Institutional deliveries coverage in the 1st trimester	
	(1)	(2)	(3)	(4)	(5)
Treatment	2.572* (1,514)	3.445** (1,356)	3.391*** (1,210)	-6.135 (6,322)	-1.264 (7,875)
Observations	471	471	471	570	570
R ²	0.371	0.453	0.486	0.200	0.349
Mean (Control Group)	15.508 (0,698)	15.508 (0,698)	15.508 (0,698)	58.627 (4,217)	58.627 (4,217)
Paired fixed effects	Yes	Yes	Yes	Yes	Yes
District and time fixed effects	No	Yes	Yes	No	Yes
Controls	No	No	Yes	No	No

Notes: Standard errors are in parenthesis, clustered at the facility level. Results are adjusted for matched pairs, matched dummies and controls not reported. All variables used for pairwise matching are included as controls. The data is collected at the facility level (98 facilities) per month (6 months). antenatal care = Antenatal-care visits. *** p<0.01, ** p<0.05, * p<0.1.

VII. Mechanisms: NHC level results

Qualitative evidence suggests that CBVs face many challenges that affect their motivation. For instance, CBVs without transportation must sometimes walk long distances to visit clients. In some cases, CBVs are provided with bicycles but with no support to maintain them. Other challenges include negative attitudes and traditional beliefs among pregnant women and difficulties identifying pregnant women who could not disclose their pregnancy early enough. We, therefore, tested the type of strategies that were more successful in bringing women into health facilities in the first trimester of their pregnancy.

Table 3 presents results for matched-pair fixed-effect regressions with the number of women accompanied, referred, and the total (referred + accompanied) who sought antenatal care in the first trimester at the NHC level. The analysis is at the NHC level, covering ninety-eight health facilities and 831 NHCs for the January-June 2020 period.

Overall, we found that incentives led to an increase in the number of women who were accompanied to seek antenatal care but no significant change in the proportion of women who went unaccompanied. The overall results are that there was no change in total antenatal-care attendance in the first trimester. Columns 1 and 2 show the treatment effect on the number of women accompanied to seek antenatal care in the first trimester with matched-paired fixed-effects. The treatment coefficient of 0.267 in Column 1 is significant, suggesting that providing monetary incentives to CBVs led to a thirty-three-percentage-point increase in the number of women who were accompanied to seek antenatal care in the first trimester (significant at the 10% level). Column 2 adds district and month fixed effects controls. The treatment effect decreased to 0.230 or a twenty-nine-percentage-point increase in the number of women who were accompanied to seek antenatal care in the first trimester, but the result was not statistically significant.

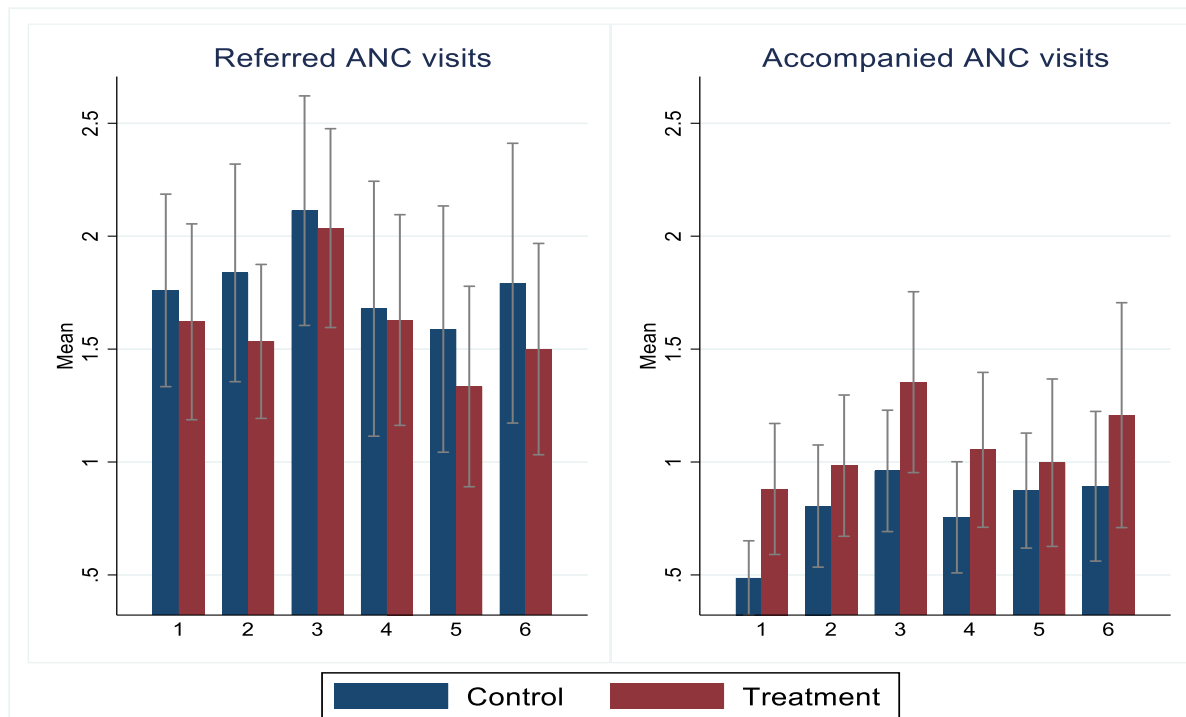
Table 3: OLS Regression—NHC-Level Regression Results on Early Initiation of Antenatal Care

	Accompanied for Antenatal Care		Referred for Antenatal Care		Total	
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.267* (0.139)	0.230 (0.142)	-0.164 (0.211)	-0.244 (0.221)	0.094 (0.321)	-0.022 (0.330)
Observations	3675	3338	3677	3340	3686	3350
R ²	0.104	0.128	0.171	0.217	0.153	0.192
Mean (control)	0.793 0.037	0.793 0.037	1.792 0.06	1.792 0.06	2.579 0.084	2.579 0.084
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Notes: Standard errors are in parenthesis, clustered at the facility number. Results are adjusted for matched pairs. Matched dummies and controls not reported. Controls included are training group (dummy variable with three categories), population in facility catchment area. The data is collected at NHC level (ninety-eight facilities) per month (six months). The mean of control group is different from the constant because all the models include matched paired fixed effects. In a model without matched paired fixed effects, the mean of the control group and constant are the same. *** p<0.01, ** p<0.05, * p<0.1.

Figure 3 compares average antenatal-care visits in the first trimester on a monthly basis for the intervention period (January-June 2020) for data collected at the NHC level. More women in the treatment sites were accompanied to seek antenatal care in the first trimester compared to the control sites on a month-by-month basis (Panel B). On the other hand, fewer women were referred to seek antenatal care in the treatment sites than in the control sites (Panel A). The differences for accompanied visits were significant, while those for referred visits were not.

Figure 3: Mean Antenatal-care visits (antenatal care) in Treatment and Control Sites



Note: The data is collected at the NHC level (ninety-eight facilities) per month (six months). 95% confidence intervals. Note: 1=January, 2=February, 3=March, 4=April, 5=May, 6=June. The data is collected at the NHC level (ninety-eight facilities) per month (six months). 95% confidence intervals. Source: Authors' computation from NHC survey data.

Potential Heterogeneous Effects at the Facility and NHC Level

To deal with potential heterogeneous effects on monetary incentives to NHCs that resulted from the type of facility, we included controls for health posts and health centers and re-estimated Equation 1. We found that including facility-type fixed effects did not affect statistical significance for the number of antenatal care visits and deliveries in healthcare facilities, but effect sizes were attenuated (See Table H1). Similarly, at the NHC level, we introduced controls for health posts vs. health centers and re-estimated Equation 1. We found that the inclusion of facility-type fixed effects did not affect the direction of the effects of monetary incentives to NHCs on antenatal care initialization. We did, however, observe a loss in statistical significance for the number of women accompanied to treatment sites.

VIII. Conclusion and Policy Implications

Our results show that monetary incentives increased the number of antenatal care visits in the first trimester, which is consistent with other literature (Ormel et al., 2019; Scott et al., 2018). These findings further suggest that even small monetary incentives can increase the motivation of CBVs (Singh et al., 2015). Similarly, in Nigeria, small monetary incentives were associated with increased referrals to health facilities by community volunteers of women about to give birth (Chukwuma et al., 2019). The results also show that the number of women accompanied to seek early antenatal care increased significantly at the NHC level. Evidence shows that monetary incentives effectively increased early initiation of antenatal care among low-risk mothers (Celhay et al., 2019). It is also plausible that the increase was among the newly pregnant who were relatively easier to accompany than were those with previous births. For CBVs, regular compensation is a sign that their work is acknowledged and approved, and this enables them to earn a living or supplement other sources of income. In addition, the consistent provision of incentives sustains motivation (Ormel et al., 2019). In Tanzania, evidence has shown that, even in the case of intrinsically motivated community-health workers, monetary incentives enabled them to increase their commitment to work (Greenspan et al., 2013).

Further, monetary incentives increased the number of deliveries in health facilities even if they were not successful in increasing the delivery in health facilities coverage rate. The results suggest that motivating CBVs provided broader maternal health benefits, and there is a need to critically examine other factors beyond the actions or efforts of health workers or volunteers that hinder timely attendance. We conclude that monetary incentives to CBVs can increase their motivation, increasing accompanied visits and deliveries in healthcare facilities. There is a need to develop appropriate financial incentives for CBVs that take resource availability into account.

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Appendices

Appendix A: Orientation Guidelines and Field Plan

Orientation Guidelines: Impact Evaluation of the Effect of Community Results-Based Financing on Early Initiation of Antenatal-care visit among Pregnant Women

Introduction

This package is meant to provide guidelines to the project staff on the procedure to be followed during the orientation visits to be conducted in the treatment and control districts in Central Province prior to the baseline and subsequent project implementation. It is imperative that the guidelines are strictly followed to avoid accidental contamination through excess information sharing in both treatment and control areas. The training will provide the same information on the scorecard in both sites with the only difference being the additional explanation of the incentive pack in the treatment area.

Treatment Areas

Audience: NHC chairpersons, secretaries.

Objectives: The main objective of this section is to provide guidance to the research team on the procedure to be undertaken in the orientation of NHC members in the **treatment** areas before the implementation of the project. The specific objectives are to set guidelines on the procedures to be followed in:

- Training NHC chairpersons and secretaries on the procedure to be followed in filling out the scorecard which captures the number of women referred to the health facility in their first trimester of pregnancy before fourteen weeks.
- Training NHC chairpersons and secretaries on the procedure for submission of the completed scorecards.
- Familiarizing NHC chairpersons and secretaries with the incentives provided for the referral of pregnant women before fourteen weeks.

Mode of Delivery: The mode of delivery will be face to face. The meetings are expected to be held at the health facilities in collaboration with the facility in charge.

Training Components

1. Introduction to the Adapted Community-Level Score Card

The scorecard is adapted from the Neighbourhood Health Committee Guidelines and the Community HMIS developed by MOH and is due to be rolled out in due time. The rationale for the scorecard in the original documents is to collect information needed to monitor the performance of the NHC on a monthly basis based on the revised NHC guidelines. For our purposes, we adapt it to collect information on age and gender composition, and number of years in existence (experience) of the NHC. Emphasis must be put on the need to collect accurate information on the number of referred and accompanied pregnant women for first antenatal-care visits by the Safe Motherhood Action Groups and the number of (maternal) health education meetings held in the communities and number of people in attendance (or an approximation).

These scorecards will be collected at the end of each month and submitted to the facility in charge which will remit the payments based at the end of every quarter after cross-validation with HMIS statistics on the numbers indicated. The payment will be based on the total number, referred and accompanied by the SMAGs. This information will then be transmitted to the research team via mobile phone and entered into a database to be created. In total, the forms will have to be completed six times over the course of the intervention and payments will be made twice, at the end of March and June 2020.

2. Explanation of the Treatment

The NHC members present will be informed that a fee of ZMW 4 will be paid for each pregnant woman that is referred or accompanied for antenatal care within the first trimester before fourteen weeks. At the end of every quarter, we will count how many women were referred and accompanied for each NHC based on their forms and cross-validated with the information from HMIS and the NHC will be paid accordingly.

It is **important** that no further urging on the importance of antenatal-care visits is done aside from the text message and poster that will be done for all the sites -the treatment explanation should be as brief as possible. The researcher should note any follow-up

discussion from the audience on the treatment for documentation purposes.

Proposed agenda for the orientation - time limit (one and a half hours)

- i. Welcome all the attendants
- ii. Introductions
- iii. Welcome remarks from the manager
- iv. Review of the NHC Scorecard
- v. Explanation of the Treatment
- vi. Closing remarks and payment of transport allowances.

Control Areas

Audience: NHC chairpersons, secretary.

Objectives: The main objective of this section is to provide guidance to the research team on the procedure to be undertaken in the orientation of NHC members in the **control** areas before the implementation of the project. The specific objectives are to set guidelines on the procedures to be followed in:

- Training NHC chairpersons and secretaries on procedure to be followed in filling out the scorecard which captures the number of women referred to the health facility in their first trimester of pregnancy before fourteen weeks.
- Training NHC chairpersons and secretaries on procedure for submission of the completed scorecards.

Mode of Delivery: The mode of delivery will be face to face. The meetings are expected to be held at health facilities in collaboration with the facility in charge.

Training Components

Introduction to the Adapted Community-Level Score Card

The scorecard is adapted from the Neighbourhood Health Committee Guidelines and the Community HMIS developed by MOH and is due to be rolled out in due time. The rationale

for the scorecard in the original documents is to collect information needed to monitor performance of the NHC on a monthly basis based on the revised NHC guidelines. For our purposes, we adapt it to collect information on age and gender composition, and number of years in existence (experience) of the NHC. Emphasis must be put on the need to collect accurate information on the number of referred and accompanied pregnant women for the first antenatal care visit by the Safe Motherhood Action Groups and the number of (maternal) health education meetings held in the communities and number of people in attendance (or an approximation).

These scorecards will be collected at the end of each month and submitted to the facility in charge which will remit the payments based at the end of every quarter after cross-validation with HMIS statistics on the numbers indicated. The payment will be based on the total number, referred and accompanied by the SMAGs. This information will then be transmitted to the research team via mobile phone and entered into a database to be created. In total, the forms will have to be completed six times over the course of the intervention and payments will be made twice, at the end of March and June 2020.

It is important that no further urging on the importance of antenatal-care visits is done aside from the text message and poster that will be done for all the sites -the treatment explanation should be as brief as possible. The researcher should note any follow up discussion from the audience on the treatment for documentation purposes. Though we do not envisage numerous follow up questions about the reason for the data collection, a plausible explanation that does not affect this RCT is that we are testing the tool for effectiveness and adequacy before it is rolled out.

Proposed agenda for the orientation: time limit (one hour)

- i. Welcome all the attendees
- ii. Introductions
- iii. Welcome remarks from the facility manager
- iv. Review of the NHC scorecard
- v. Closing remarks and payment of transport allowances.

Field Plan

- The first point of contact in the district is the District Health Office
- Present the letter from Permanent Secretary/Provincial Health Director and formally introduce the project
- Provide the project proposal
- Inform District Health Director about the payment mechanism for incentives and that we will report to the DHD/designated person at district when payments are disbursed to the health facility
- Inform DHD that we will place posters in the health centers and send text messages to all NHCs and SMAGs/CBVs working on maternal health
- Ask for assistance for someone to accompany or direct team to sampled health facilities, if necessary

Health Centers

- Briefly discuss the project with health facility manager
- Explain intervention and make the message neutral [don't explain why we are paying but state that for every woman referred or accompanied by NHC, we compensate]
- Inform the manager about monthly data collection from the NHC in the zones with active NHCs
- Inform manager that data transmission for the NHC aggregated data will be monthly, and discuss appropriate means of transfer of data (either through phone call or picture) or email
- Payment of incentives for NHCs will be through mobile money or manager bank account [discuss which option will be better]. Inform the manager that for accountability and supervision, we will notify the District Health Office when the disbursements are made.
- Inform the manager about fixed payment rate to help validate and transmit the

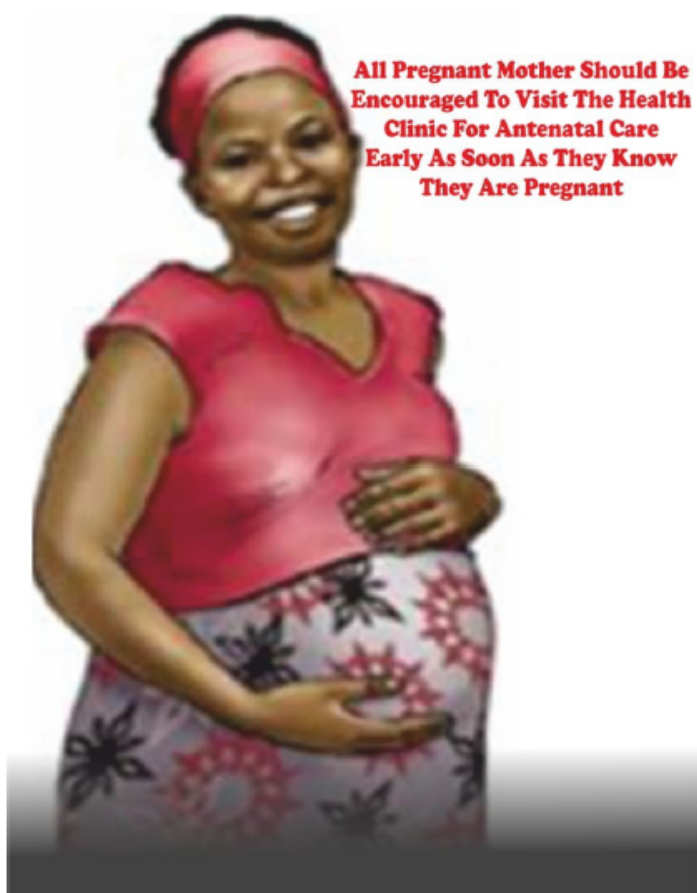
data to the center (in both control and treatment sites). K100 to be paid monthly to cover transmission costs and assistance with validation of data from the NHCs

- Inform manager about the posters and that they have been cleared by MOH. Place the poster in the manager's office or NHC room (where CHVs have access)

NHC

- During orientation, confirm NHC chairperson's number and then get contact numbers for the active SMAGS/CBV working on maternal health. We need to send text messages to NHC and CBV/SMAGs after orientation
- Use template for collecting phone numbers for (active) SMAGs/CBVs
- Emphasize to the NHC and manager that data is needed by the 15th of the following month

Appendix B: Poster and Text Message



Text message

Remind pregnant women to start antenatal-care visits within the first three months of pregnancy.

Appendix C: Generating the Distance Buffer

The catchment areas for all health facilities and health posts in Zambia are divided into zones. The number of zones per facility depends on the size of the catchment area. Each facility zone has one NHC, which generally consists of about 15 members. If the facility zones in the treatment and control facilities share a common boundary (are neighbours), information-sharing may occur between the two NHCs. NHCs in the control facilities may work harder to increase utilization rates of antenatal care (in the first trimester of pregnancy) in their respective zones with the hope that the women may also enroll in the project at some point. By interacting with NHC members in the treatment facilities, NHC members in the control facilities may appreciate the importance of early antenatal-care visits even more, and, in turn may encourage women to seek antenatal care in the first trimester.

The main concern is for NHC zones in the control facilities that are at the border, rather than those that are further from a boundary. By creating a distance buffer between the facilities, we were able to reduce contamination for NHC zones in the control facilities that were further from the borders of the NHC zones in the treatment facilities.

The first step in creating the distance buffer was to compute the distance of each facility from all the other facilities in the sample, regardless of the pairing. We also identified treatment and control combinations for adjacent pairs and non-pairs. To reduce contamination, adjacent treatment and control facilities within a proximity of eight kilometres (km) were dropped from the sample. For each facility identified, we dropped the corresponding pair. Ideally, we preferred a distance buffer of 10-15 km, but we were unable to adhere to this criterion because it further reduced the sample. The final sample consisted of ninety-eight rural health facilities (twenty-one rural health posts and seventy-seven rural health centers). In the final sample, all treatment and control facilities were eight kilometres apart, regardless of whether they were a pair or not (see Figure 3). Some adjacent facilities that were either

treatment or controls (that is, non-treatment-and-control combinations) were closer than eight kilometres. However, this scenario is non-problematic because we did not expect any contamination for this type of facility combination. To further address contamination at the borders, we manually verified with facility managers on the NHC boundaries in cases in which a treatment facility shared a border with a control site. Given that the intervention period was only six months long, any contamination that took place, after mitigation measures were implemented, was minimal. Furthermore, many of these facilities, particularly those remote from District Medical Offices, were off mobile networks, which further reduced the possibilities of contamination.

Appendix D: Power Determination

We used the following characteristics to determine the power of the study:

1. Proportion of pregnant women attending antenatal care visits in the first trimester, estimated at 24% according to the 2018 Zambia Demographic Health Survey
2. Minimum detectable effect of fifteen percentage points. (Based on a study involving community health workers and maternal health outcomes (Chukwuma et al. (2019)).
3. Type one error probability is set at 5%.
4. Intra-cluster correlation of 0.06 (Based on a prior study in Zambia)
5. Sample size of forty-nine health facilities in treatment and the same number in control determined using pairwise matching.
6. Average of six NHCs per facility.

The power of the study based on these characteristics is 93%.

Appendix E: Adapted Community-Level Score Card

Name of facility							
Name of community/ zone							
Zonal population: Total No. of Men/Total No. of Women							
Number of SMAG members: Total No. of Men/Total No. of Women							
Number of NHC members: Total No. of Men/Total No. of Women							
When was the current NHC set up (Month/ Year)?							
		J a n u a r y	F e b r u a r y	M a r c h	A p r i l	M a y	J u n e
		N u m b e r	N u m b e r	N u m b e r	N u m b e r	N u m b e r	N u m b e r
No.	Focus Area						
Com 2.1.7	Pregnant women referred to health facilities by SMAGs/CBVs within fourteen weeks (three months) for antenatal care						
Com 2.1.8	Pregnant women accompanied to the health facilities by SMAGs/ CBVs within fourteen weeks (three months)						

Challenges met:

Solutions:

Recommendations:

Appendix F: Qualitative Tools

Qualitative Questionnaire for Health Workers

KEY INFORMANT INTERVIEW GUIDE

IMPACT EVALUATION OF COMMUNITY RESULTS-BASED FINANCING ON EARLY INITIATION OF ANTENATAL VISITS AMONG PREGNANT WOMEN

Introduction

Good morning/afternoon/evening. My name is _____ and I am working with the Institute of Economic and Social Research (INESOR). We are here today to find out whether the programme that provides incentives to community health workers who encourage women to attend antenatal care in the first trimester has any impact on service use or not.

Your participation in this study is purely voluntary and you have the right to decide to participate or not to participate in the study. You are also entitled to privacy and confidentiality and at no time are you obliged to divulge your real name and identity and you are at liberty to withdraw from the study at any time or not to respond to any or all the questions. We will record the interview to facilitate accuracy during the analysis. The interview will take less than 30 minutes.

Key Informant Interviews with Health Facility Manager

1. What is your role and responsibility as health facility manager?
2. Are you aware of the community results-based financing project that aims to improve use of antenatal care services among pregnant mothers that is being implemented at your facility? How long has the intervention been implemented at your facility?
3. What type of services do the community workers (NHCs and SMAGs) provide in the community? Have there been any changes in how they operate since the community RBF intervention was implemented?
4. Do you think there has been any changes in the use of maternal health services/antenatal care due to the activities of the NHCs/SMAGs? Please explain.
5. Have you experienced any challenges in working with NHCs/ SMAGs who are participating in this community RBF programme?
6. What challenges do the NHCs/ SMAGs face in providing their services?
7. Do you interact with the health workers in the facilities that are not implementing the community RBF? Do you discuss the intervention with them? Please explain
8. How did the gassing incident that occurred in January affect maternal health service delivery at your facility? How did it affect the community health workers?
9. How has the COVID-19 pandemic affected maternal health service delivery at your facility? How has it affected the community health workers?

Qualitative questionnaire for community health workers

KEY INFORMANT INTERVIEW GUIDE

IMPACT EVALUATION OF COMMUNITY RESULTS-BASED FINANCING ON EARLY INITIATION OF ANTENATAL VISITS AMONG PREGNANT WOMEN

Introduction

Good morning/afternoon/evening. My name is _____ and I am working with the Institute of Economic and Social Research (INESOR). We are here today to find out whether the programme that provides incentives to community health workers who encourage women to attend antenatal care in the first trimester has any impact on service use or not.

Your participation in this study is purely voluntary and you have the right to decide to participate or not to participate in the study. You are also entitled to privacy and confidentiality and at no time are you obliged to divulge your real name and identity and you are at liberty to withdraw from the study at any time or not to respond to any or all the questions. We will record the interview to facilitate accuracy during the analysis. The interview will take less than 30 minutes.

Key Informant Interview with the Community Health Workers (SMAGS/NHCs)

1. What is your role and responsibility as NHC/SMAG in this community?
2. Are you aware of the community results-based financing project being implemented in your zone? How long has the intervention been implemented in your zone?
3. What type of services do you as community workers (NHCs and SMAGs) provide in the community? Have there been any changes in the way you operate since the community RBF intervention was implemented?
4. Do you think there has been any changes in the use of maternal health services due to your activities as the NHCs/SMAGs? Please explain.
5. What challenges do you, as community health workers, face in providing your services to the community?
6. What challenges do community members face in accessing maternal health services at the facility?
7. Do you interact with the community groups in the facilities that are not implementing the community RBF? Do you discuss the intervention with them? Please explain
8. How did the gassing incident that occurred in January affect maternal health service delivery at your facility and your work as community health workers?
9. How has the COVID-19 pandemic affected maternal health service delivery at your facility and your work as community health workers?

Information Sheet and Consent Form

THE UNIVERSITY OF ZAMBIA

INSTITUTE OF ECONOMIC AND SOCIAL RESEARCH

—

This informed consent form is for health providers and community health workers in Central Province who we are inviting to participate in the research titled *“impact evaluation of community results-based financing on early initiation of antenatal-care visit among pregnant women: a matched pair, parallel design cluster randomized trial.”*

- Principal Investigator: Dr. Chitalu Miriam Chama-Chiliba
- Name of Organisation: University of Zambia (UNZA) and Ministry of Health
- Name of Sponsor: Partnership for Economic Policy (PEP)
- Name of Project: Impact evaluation of community results-based financing on early initiation of antenatal-care visit among pregnant women: a matched pair, parallel design cluster randomized trial

This Informed Consent Form has two parts:

- Information Sheet (to share information about the study with you)
- Certificate of Consent (for signatures if you choose to participate)

You will be given a copy of the full Informed Consent Form

Part I: Information Sheet

Introduction

I am a researcher from the Institute of Economic and Social Research (INESOR). I am doing research on antenatal care in the early stages of pregnancy (first fourteen weeks of pregnancy), which is an important issue in this country. I am going to give you information and invite you to be part of this research. Before you decide whether or not to participate, you can talk to anyone you feel comfortable with about the research. This consent form may contain words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of me or of another researcher

Purpose of the Research

Seeking early antenatal care (during the first fourteen weeks of pregnancy) is important for the good health of the unborn baby and mother. But very few women in Zambia start antenatal-care visits during the early stages of pregnancy. The government would like to ensure that the women understand the importance of seeking antenatal care early and actually start going for antenatal care early. The study is providing support to the community workers in your community to encourage women to seek antenatal care early.

Type of Research Intervention

This research will involve your participation in an interview that will take about half an hour

Participant Selection

You are being invited to take part in this research because we feel that your experience as a community worker or health provider can contribute much to our understanding of how community workers can contribute to the increasing the use of early antenatal care services among pregnant women.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. The choice that you make will have no bearing on your job or on any work-related evaluations or reports. You may change your mind later and stop participating even if you agreed earlier.

Procedures

We are asking you to help us learn more about the role that community health workers play in encouraging women to seek antenatal care early. We are inviting you to take part in this research project. If you accept, you will be asked to participate in an interview with myself.

During the interview, I will sit down with you in a comfortable place at the health center. If you do not wish to answer any of the questions during the interview, you may say so and the interviewer will move on to the next question. No one else but the interviewer will be present unless you would like someone else to be there. The information recorded is confidential, and no one else except other researchers on the study will access the information documented during your interview. The entire interview will be tape-recorded, but no one will be identified by name on the tape. The tape will be kept safely at the University of Zambia, with restricted access. The information recorded is confidential, and no one else except the researchers will have access to the tapes. The voice messages will be deleted after 10 weeks from the time of data collection.

Duration

The research takes place over nine months in total. During that time, we will visit you once to interview you and the interview will last for about one hour each.

Risks

There is a risk that you may share some personal or confidential information by chance, or that you may feel uncomfortable talking about some of the topics. However, we do not wish for this to happen. You do not have to answer any question or take part in the interview if you feel the question(s) are too personal or if talking about them makes you uncomfortable.

Benefits

There will be no direct benefit to you, but your participation is likely to help us find out more about how we can improve the use of antenatal services among pregnant women in Zambia

Reimbursements

You will not be provided any incentive to take part in the research. However, we will give you transport refund to cover travel expense (if applicable).

Confidentiality

The research being done in the community may draw attention and if you participate you may be asked questions by other people in the community. We will not be sharing information about you to anyone outside of the research team. The information that we collect from this

research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will lock that information up with a lock and key. It will not be shared with or given to anyone except the research team on this study.

Sharing the Results

Nothing that you tell us today will be shared with anybody outside the research team, and nothing will be attributed to you by name. The knowledge that we get from this research will be shared with you and other stakeholders before it is made widely available to the public.

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so, and choosing to participate will not affect your job or job-related evaluations in any way. You may stop participating in the discussion at any time that you wish without your job being affected. I will give you an opportunity at the end of the interview to review your remarks, and you can ask to modify or remove portions of those, if you do not agree with my notes or if I did not understand you correctly.

Whom to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact any of the following: Dr. Chitalu Miriam Chama-Chiliba, UNZA, Lusaka, Zambia, +260 955877504

This proposal has been reviewed and approved by ERES CONVERGE, which is a committee whose task it is to make sure that research participants are protected from harm. If you wish to find out more about the IRB contact the following: Dr. J. Mwanza, ERES Converge IRB, 33 Joseph Mwilwa Road Rhodes Park, Lusaka, Zambia, +260 955 155633 / +260 955 155634.

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

Part II: Certificate of Consent

I have been invited to participate in research about early antenatal care and community health workers in Central Province.

(This section is mandatory)

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Print Name of Participant _____

Signature of Participant _____

Date _____

Day/month/year

If illiterate⁷

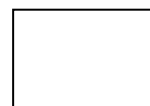
I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness _____ Thumb print of participant

Signature of witness _____

Date _____

Day/month/year



Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. Interview

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print Name of Researcher/person taking the consent _____

Signature of Researcher /person taking the consent _____

Date _____

Day/month/year

⁷ A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print.

Appendix G: Attrition Tables at the Facility and NHC Level

Table G1—Attrition

	Facility Level		NHC Level	
	Antenatal-care visits, antenatal-care coverage, and institutional deliveries coverage	Total institutional deliveries	Accompanied for antenatal care	Referred for antenatal care
January	6	15	197	197
February	3	11	247	248
March	4	13	273	270
April	3	27	197	197
May	0	16	191	191
June	2	35	217	217
Total	18	117	1322	1320

Notes: The data is collected at the facility level (98 facilities) per month (6 months) for the period January 2020 and for the NHC level the data is collected covering 98 health facilities and 833 NHCs for the period January 2020 to June 2020. antenatal care = Antenatal-care visits.

Table G2—Attrition Analysis at Facility and NHC Level

	Facility Level		NHC Level	
	antenatal care Coverage in the 1st Trimester	Total Institutional deliveries in the 1st Trimester	Accompanied for antenatal care	Referred for antenatal care
Treatment	-0.004 (0,017)	0.006 (0,040)	-0.069 (0,055)	0.068 (0,055)
Month "February"	-0.030 (0,027)	-0.040 (0,043)	0,059*** (0,013)	0,060*** (0,013)
Month "March"	-0.020 (0,252)	-0.020 (0,035)	0,090*** (0,023)	0,087*** (0,022)
Month "April"	-0.030 (0,030)	0,122** (0,590)	0.000 (0,028)	0.000 (0,028)
Month "May"	-0,061** (0,024)	0.010 (0,047)	-0.007 (0,031)	-0.007 0.031
Month "June"	-0.040 (0,024)	0,204*** (0,058)	0.023 (0,031)	0.023 (0,031)
Number of inpatient beds	0,008* (0,004)	0.006 (0,004)		
Number of maternity beds	-0.009 (0,006)	-0,016* (0,008)		
Distance to district medical office	0.000 (0,000)	0,001* (0,000)		
Population in catchment area	-3.140 (1,950)	1.870 4.330		
Observations	588	588	4997	4997

Notes: Standard errors are in parenthesis, clustered at the facility level. The data is collected covering 98 health facilities and 833 NHCs for the period January 2020 to June 2020. antenatal care = Antenatal-care visits. *** p<0.01, ** p<0.05, * p<0.1.

Appendix H: Additional Facility and NHC Level Analysis

Table H1 presents the results for the matched-pair fixed-effect regressions with the number and coverage rate for antenatal-care visits in the first trimester and deliveries at healthcare facilities.

Table H1: Facility-Level OLS sensitivity analysis

Panel A: Antenatal-care visits in the first trimester		
	%	Number
	(I)	(II)
<i>Treatment</i>	0.920 (1.846)	22.662** (9.645)
<i>Constant</i>	83.626*** (12.339)	241.768*** (65.319)
<i>Mean (control)</i>	29.523 (1.540)	79.851 (5.007)
<i>N</i>	570	570
Panel B: Deliveries in healthcare facilities		
	%	Number
	(I)	(II)
<i>Treatment</i>	-2.012 (7.754)	3.274*** (1.206)
<i>Constant</i>	110.407*** (36.107)	53.451*** (8.491)
<i>Mean (control)</i>	58.628 (4.218)	15.508 (0.698)
<i>N</i>	570	471
Controls	YES	YES
Paired fixed effects	YES	YES
District and time fixed effects	YES	YES

Note: Standard errors are in parenthesis, clustered at the facility level. Results are adjusted for matched pairs, matched dummies and controls not reported. All variables used for pairwise matching and the type of facility are included as controls. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The data is collected at the facility level (ninety-eight facilities) per month (thirty months, January 2018 to June 2020).

Table H2 shows the results for the matched-pair fixed-effect regressions with the number of women accompanied, referred, and the total (referred + accompanied) to seek antenatal care in the first trimester at the NHC level.

Table H2: OLS Sensitivity Regression—NHC-level regression results on early initiation of antenatal care

	Accompanied for antenatal visit		Referred for antenatal visit		Total (Referred + accompanied for antenatal visit)	
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment	0.19 (0.130)	0.165 (0.136)	-0.258 (0.188)	-0.308 (0.200)	-0.077 (0.285)	-0.15 (0.303)
Mean (control)	0.794 (0.037)	0.794 (0.037)	1.793 (0.060)	1.793 (0.060)	2.579 (0.085)	2.579 (0.085)
Constant	1.581*** (0.562)	1.025* (0.607)	1.357*** (0.456)	0.358 (1.128)	2.929*** (0.695)	1.392 (1.543)
Observations	3675	3338	3677	3340	3686	3350
R²	0.115	0.135	0.181	0.221	0.166	0.199
Controls	No	Yes	No	Yes	No	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are in parenthesis, clustered at the facility level. Results are adjusted for matched pairs. Matched dummies and controls not reported. Controls included are training group (dummy variable with three categories), population in facility catchment area and type of facility (health post or health center). The data is collected at NHC level (ninety-eight facilities) per month (six months). The mean of control group is different from the constant because all the models include matched paired fixed effects. In a model without matched paired fixed effects, the mean of the control group and constant are the same. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' computation from NHC survey data.